spacing ribs between said sheets and forming with said sheets a plurality of fluid conduits within said fluid passageway and a plurality of external conduits within said external passageways, and

manifold means including fluid communication means for the inflow or outflow of fluid to or from the fluid conduits, and gas communication means for the inflow or outflow of gas to or from the external conduits;

A6

wherein said panel is sealed at the sides thereof by said spacing ribs and is open at the ends thereof to provide access to said conduits which extend from one end of the panel to the other end thereof, and said pair of internal sheets at the ends of said internal passageway extend beyond said external sheets at the ends of said external passageways thereby facilitating fusion welding to said internal sheets at the ends of said internal passageway.

REMARKS

The Office Action dated September 9, 2002 has been reviewed carefully and the application amended in order to place the same in condition for allowance. Reconsideration of the rejection and allowance of the claims are respectfully requested on the basis of the following remarks.

The Invention:

The present invention provides a heat exchange assembly that may be used as a roofing panel. The heat exchange assembly includes, an internal fluid passageway formed between a pair of spaced substantially parallel internal sheets for the passage therethrough of a fluid, and respective external passageways formed between each internal sheet and a respective external sheet spaced from and substantially parallel to a respective internal sheet, as well as a manifold structured to direct the fluid flow through the passageways.

The sheets can be separated by any suitable spacing means such as posts or the like. However it is preferred that the heat exchange assembly includes spacing ribs between the sheets and forming with the sheets a plurality of fluid conduits within the fluid passageway and a plurality of external conduits within the external passageways.

The heat exchange assembly further includes a fluid inlet means at one end of the fluid conduits for the inflow of fluid in the heat exchange assembly, and fluid outlet means at the other end of the fluid conduits for the outflow of fluid from the heat exchange assembly. The external passageways can contain another liquid however it is preferred that the external passageways are adapted to receive or contain a gas for effecting heat exchange between the fluid in the fluid passageway and the exterior of the heat exchange assembly.

The heat exchange assembly can be of any suitable shape and configuration consistent with the above. However it is preferred that the heat exchange assembly constitutes a panel sealed at the sides thereof by the spacing ribs and open at the ends thereof to provide access to the conduits which extend from one end of the panel to the other end thereof. Fluid and or gas supplies may be connected directly to the respective conduits at the ends of the panel. However, it is preferred that the heat exchange assembly includes an inlet manifold and an outlet manifold at respective ends of the panel. Preferably the inlet manifold and the outlet manifold include the fluid inlet means and the fluid outlet means respectively. The inlet manifold and the outlet manifold also preferably include the gas inlet means and the gas outlet means respectively.

Status of the Claims

Claims 1-5, 9, 10, 12, and 14-16 remain pending in this application. Claims 6-8, 11, and 13 have been canceled.

Claims 1-5, 12 and 14-16 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Saperstein et al.*, U.S. Patent No. 5,242,015.

Claims 1-5, 12 and 14-16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Erb*, U.S. Patent No. 4,114,597 in view of *Saperstein* and Canadian Patent 1,183,520 (Canada '520).

Claims 9 and 10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Erb*, *Saperstein*, or Canada '520 in view of *Johnson*, U.S. Patent No. 4,060,072.

The Drawings, specifically Figures 6-8, are objected to.

Objections to the Drawings

With regard to the objections to the drawings, Applicant submits herewith for review proposed versions of Figs. 3, 4, 6-8 including corrections indicated in red ink.

Claims 1-5, 12 and 14-16; rejected under 35 U.S.C. §102(b)

Claims 1-5, 12 and 14-16 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Saperstein et al.*, U.S. Patent No. 5,242,015. *Saperstein* discloses, in Figures 6-8 as cited by the Examiner, a heat exchanger coil having two separate inlet and outlet pipes coupled to the separate fluid passageways of the heat exchanger. The Examiner contends that the coil of *Saperstein* is the equivalent to a flat panel. Applicant strongly disagrees.

Applicant notes that the coil of *Saperstein* cannot be used as a roofing panel as discussed and claimed in the present invention. This is because the coil of *Saperstein* is not a flat panel as suggested by the examiner. It is axiomatic that a flat panel must be, by definition, flat. The coil of *Saperstein* is, also by definition, a coil and cannot be "flat." Beyond the simple external shape differences of the *Saperstein* heat exchanger and the present invention, the coil shape of *Saperstein* is also not equivalent to a flat panel as flat panels have different heat transfer properties than a coil. Additionally, in regards to the conduits extending through the heat exchanger, the speed, turbulence, and other fluid flow characteristics of a fluid passing through a flat panel are different from a fluid passing through a coil. Accordingly, the Examiner has not adequately supported the contention that the coil of *Saperstein* is the equivalent to a flat panel or a sheet.

Additionally, as amended, claim 1 recites a manifold. A manifold is defined as, "**a** pipe or tube with at least one inlet and two or more outlets ...." *Webster's New Twentieth Century Dictionary*, Second Edition, 1976 (emphasis added). Attached as Exhibit 1. That is, a manifold is a single pipe having multiple connections thereto. The structure shown in *Saperstein* includes separate pipes coupled to each of the passageways of the heat exchanger. As such, *Saperstein* does not disclose the use of a manifold.

As stated in MPEP §2131:

> A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference....

> The identical invention must be shown in as complete detail as is contained in the ... claim.

Verdigaal Brothers v. Union Oil Company of California, 814 F.2d 628, 631 (Fed. Cir. 1987) and *Richardson v. Suzuki Motor Company*, 868 F.2d 1226, 1236, (Fed. Cir. 1989). It is respectfully submitted that upon reading the *Saperstein* disclosure, one skilled in the art would not consider a heat exchanger having parallel sheets or a manifold as recited in claim 1.

Independent claim 1, as amended, recites a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold. As this reference fails to disclose a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold, it cannot logically be stated that this reference anticipates the invention as recited in claim 1.

Claims 2-5 depend, directly or indirectly, from claim 1 and rely on their dependency for patentablity.

Independent claim 12, as amended, recites a roofing panel that incorporates a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold. As this reference fails to disclose a roofing panel that incorporates a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold, it cannot logically be stated that this reference anticipates the invention as recited in claim 12.

Claims 14 and 15 depend from claim 12 and rely on their dependency for patentablity.

Independent claim 16, as amended, recites a heat exchange panel that incorporates a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold. As this reference fails to disclose a heat exchange panel that incorporates a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold, it cannot logically be stated that this reference anticipates the invention as recited in claim 16.

Accordingly, the Applicant respectfully requests that the Examiner withdraw the rejection 35 U.S.C. §102(b) set forth on page 2 of the September 9, 2002 Office Action.

Claims 1-5, 12 and 14-16 stand rejected under 35 U.S.C. §103(a)

Claims 1-5, 12 and 14-16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Erb*, U.S. Patent No. 4,114,597 in view of *Saperstein* and Canadian Patent 1,183,520 (Canada '520). *Saperstein* is discussed above. *Erb* discloses a solar collector. The solar collector is structured to absorb solar energy and does not act as a heat exchanger. As such, the *Erb* is structured to reduce or prevent energy loss via heat transfer. To accomplish this, *Erb* includes a transparent, sealed insulating chamber above an internal passageway structured to transport a fluid. That is, because the external chamber is sealed, see element 147 on figures 10 and 10A, fluid does not flow through the external chamber. Additionally, because *Erb* only includes one passageway for transporting a fluid, there is no need for a manifold as defined above. Accordingly, *Erb* fails to disclose a heat exchanger, a structure having a internal and external passageways, or a manifold.

Canada '520 discloses a method of manufacturing a heat exchanger. As shown in Figures 4, 4A, 5, and 5A, the disclosed heat exchanger relies upon a single passageway coupled to a passageway. Canada '520 does not disclose a heat exchanger having more than one passageway or a manifold as defined above.

Accordingly, the *Erb* reference is directed to a solar collector having an insulating chamber, the Canada '520 reference is directed to heat exchanger having a single passageway, and the *Saperstein* reference is directed to a heat exchanger having at least two passageways. It is unreasonable to conclude that one skilled in the art confronted with the prior art cited would in some fashion fragment the individual teachings thereof to obtain the present invention as recited in the claims. As stated in, *In re Geiger*, 815 F.2d 686, 2 U.S.P.Q.2d 1276 (Fed. Cir. 1987), "obviousness cannot be established by combining teachings of the prior art to produce the claimed invention, *absent some teaching, suggestion, or incentive supporting combination.*" (*emphasis added*)(attached as appendix 1). Put another way, "the mere fact that disclosures or teachings of the prior art can be retrospectively combined for the purpose of evaluating obviousness/ nonobviousness issue does not make the combination set forth in the invention obvious, *unless the art also suggested the desirability of the combination ....*" *Rite-Hite Corp. v Kelly Co.*, 629 F.Supp. 1042, 231 U.S.P.Q. 161, (attached as appendix 2) *aff'd* 819 F.2d 1120, 2 U.S.P.Q.2d 1915 (E.D.Wis. 1986)(emphasis added). Similarly, the court in, *In re Vaeck*, 947 F.2d 488,

20 U.S.P.Q.2d 1438 (Fed. Cir. 1991), stated that "both the suggestion [to make the claimed apparatus] and the reasonable expectation of success must be found in the prior art, not in the applicant's disclosure." (attached as appendix 3).

Here there is no suggestion that the cited references should be combined. In fact, the teachings of the references teach away from each other. The *Erb* reference teaches that the external chamber must be sealed to act as an insulating layer. This is in direct opposition to the *Saperstein* reference that teaches at least two passageways. Moreover, none of the references teach a manifold as defined above.

Independent claim 1, as amended, recites a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold. As these references cannot be combined and fail to disclose a heat exchanger having internal and external passageways formed by parallel sheets and which are coupled to at least one manifold, it cannot logically be stated that this reference teach or suggest the invention as recited in claim 1.

Claims 2-5 depend, directly or indirectly, from claim 1 and rely on their dependency for patentablity.

Independent claim 12, as amended, recites a roofing panel that incorporates a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold. As these references cannot be combined and fail to disclose roofing panel that incorporates a heat exchanger having internal and external passageways formed by parallel sheets and which are coupled to at least one manifold, it cannot logically be stated that this reference teach or suggest the invention as recited in claim 12.

Claims 14 and 15 depend from claim 12 and rely on their dependency for patentablity.

Independent claim 16, as amended, recites a heat exchange panel that incorporates a heat exchanger having passageways formed by parallel sheets and which are coupled to at least one manifold. As these references cannot be combined and fail to disclose a heat exchange panel having internal and external passageways formed by parallel sheets and which are coupled to at least one manifold, it cannot logically be stated that this reference teach or suggest the invention as recited in claim 16.

Accordingly, the Applicant respectfully requests that the Examiner withdraw the rejection 35 U.S.C. §103(a) set forth on page 3 of the September 9, 2002 Office Action.

Claims 9 and 10 stand rejected under 35 U.S.C. §103(a)

Claims 9 and 10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Erb*, *Saperstein*, or Canada '520 in view of *Johnson*, U.S. Patent No. 4,060,072. Claims 9 and 10 depend indirectly from claim 1 and rely on their dependency for patentablity.

SUMMARY AND CONCLUSION

It is respectfully submitted that claim 1-5, 12 and 14-16 are not anticipated by *Saperstein*. It is further submitted that claims 1-5, 12 and 14-16 are patentable over *Erb* in view of *Saperstein* and Canadian Patent 1,183,520 and that claims 9 and 10 are patentable over *Erb*, *Saperstein*, or Canada '520 in view of *Johnson*. Applicant respectfully submits that the application is now in proper form for issuance of a Notice of Allowance and such action is requested at an early date.

Respectfully submitted,

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VERSION TO SHOW CHANGES MADE

In the Specification:

Please replace pages 8-11 with the following:

— As is seen in more detail in FIGS 6 and 7, lateral joining strips 28 have a plurality of laterally disposed, outwardly directed and longitudinally extending ribs [29] 49 separated by inwardly directed grooves or slots 30, and a pair of opposed flanges [32] 42 and [43] 43. A plurality of apertures 31 extend along the length of strip 28 for receiving nails 29. In use, the lateral edges of sheets 16, 17, 20 and 21 extending beyond the outermost spacing ribs 18, 22 and 24 are adapted to be closely received in grooves 30 with flanges [32] 42 and [43] 43 being closely received above and below adjoining panels to provide a weatherproof seal along the lateral sides of the panels.

Joining strips 28 can be made from suitable plastic, rubberised material, fibreglass, aluminium or rolled steel. Suitable mastic sealers can also be used to improve weatherproofing.

Alternatively in an embodiment not illustrated, the joining strips can be replaced by providing a longitudinally extending female socket arrangement along one side edge adapted to closely receive the other side of the adjoining sheet in the manner of tongue and groove attachment.

As is best seen in FIGS 8 and 9, connection of fluid and gas supplies to panels 13 is effected by a manifold 32 attached to the panel ends 54 and 55. Manifold 32 is a longitudinally extending extrusion having fluid communication means in the form of a central channel [33] 38 for the inflow or outflow of fluid to or from fluid conduits 19, and gas communication means in the form of a pair of channels 34 and 35 for the inflow or outflow of gas to or from external conduits 23 and 25 respectively. Manifold 28 [has] includes receiving means in the form of a central opening 39 to central channel [33] 38 for receiving internal sheets 16 and 17, and receiving means in the form of slots 36 for receiving external sheets 20 and 21 whereby the fluid communication means [33] 38 and the gas communication means 34 and 35 are sealingly connected to the fluid passageway and the external passageways respectively.

Channels 34 and 35 communicate with the external passageways and external conduits 23 and 25 via longitudinally extending slots [38] 40 in longitudinally extending ribs 37 on either side of central opening 39. Ribs 37 are closely received in external passageways 52 and 53 at the ends 54 and 55 of panel 13.

It will be seen that the ends of interior panels 16,17 extend beyond the ends of external panels 20,21 thereby facilitating ultrasonic or other fusion welding of manifold 32 to the interior panels 20,21. This provides a better seal to the internal passageways than is obtained by adhesive bonds and the like.

The fluid or gas supply is connected to manifold 32 by means of a ported cap (not illustrated) which fits closely over one end of the manifold and has connection flanges for connecting gas and/or water lines to the manifold. A blind cap seals the other end of the manifold.

The manifold can be of a standard length corresponding to the width of a heat exchanger panel. Alternatively the manifold can be of variable length which is cut to a required length to suit individual installations with one manifold extending across a number of adjoining panels.

As with joining strips 28, manifolds 32 can be made from suitable plastic, rubberised material, fibreglass, aluminium or rolled steel. Suitable mastic sealers can also be used to improve the seal between the manifold and the ends of the panel.

In use, a method of heat exchange in accordance with the present invention is effected by passing fluid through internal fluid passageway 51 formed between internal sheets 16 and 17, whereby heat is exchanged between the fluid and gas in external passageways 52 and 53 formed between internal sheet 16 and 17 and a respective external sheet 21 and 20.

As can be seen in FIG 9, a riser 60 extends from the uppermost manifold 32 and vents to atmosphere to provide a pressure relief mechanism in the fluid passageway to relieve excess pressures which may be generated during heating of the fluid. Riser 60 comprises a U-tube which communicates with central fluid channel [33] 38 in the manifold. A ball valve or the like (not shown) can be included in the down stream leg of the U-tube.

It will be appreciated that the heat exchange panel of the present invention has a number of advantages of known systems.

The external passageways of the present invention provide a layer between the fluid passageway and the ambient conditions and depending on the gas therein improves the efficiency of absorption of solar radiation or, in providing an insulating layer can improve the effectiveness of retention of heat generated by solar radiation.

The multiple passageway construction allows the cooling and heating properties of gases such as free air and inert gases to be exploited. The gas carrying external passageways moreover enable the heat exchanger assembly of the present invention to function in conditions where solar radiation is minimal or non-existent.

The venting of the panels ensures that the operating pressure within the fluid circuit is consistent with atmospheric pressure thereby avoiding pressure induced failure of the panel.

It will of course be realised that whilst the above has been given by way of an illustrative example of this invention, all such and other modifications and variations hereto, as would be apparent to persons skilled in the art, are deemed to fall within the broad scope and ambit of this invention as is herein set forth. --

In the Claims:

1. (Once Amended) A heat exchange assembly including:[-]

an internal passageway formed between a pair of spaced substantially parallel internal sheets, [and]

respective external passageways formed between each said internal sheet and a respective external sheet spaced from and substantially parallel to a respective internal sheet;

said pair of internal sheets at the ends of said internal passageway extending beyond said external sheets at the ends of said external passageways thereby facilitating fusion welding to said internal sheets at the ends of said internal passageway, and said internal passageway or said external passageways being adapted to receive or contain a gas for effecting heat exchange with a fluid in the other of said internal passageway or said external passageways; and

said pair of internal sheets and said external sheets each coupled to, and said internal and external passageways in fluid communication with, at least one manifold.

3. (Once Amended) A heat exchange assembly as claimed in claim 1 [2], and including:[-]

a fluid inlet means at one end of said internal passageway;

[or] a gas inlet means at one end of said external passageways [for the inflow of fluid in the heat exchange assembly, and];

a fluid outlet means at the other end of said internal passageway;

[or] a gas outlet means at the other end of said external passageways [for the outflow of fluid from the heat exchange assembly]; and

said at least one manifold includes an inlet manifold coupled to, and in fluid communication with, said internal passageway fluid inlet means and said external passageway gas inlet means and an outlet manifold coupled to, and in fluid communication with, said internal passageway fluid outlet means and said external passageway gas outlet means;

whereby said internal passageway is adapted to receive or contain a fluid and said external passageways are adapted to receive or contain a gas for effecting heat exchange with the fluid in the said internal passageway.

4. (Once Amended) A heat exchange assembly as claimed in claim 1 [3], and including:[-]

[gas inlet means at one end of the other of said internal passageway;

or said external passageways for the inflow of gas to the heat exchange assembly, and

gas outlet means at the other end of the other of said internal passageway or said external passageways for the outflow of gas from the heat exchange assembly;]

a gas inlet means at one end of said internal passageway;

a fluid inlet means at one end of said external passageways;

a gas outlet means at the other end of said internal passageway;

a fluid outlet means at the other end of said external passageways;

said at least one manifold includes an inlet manifold coupled to, and in fluid communication with, said internal passageway gas inlet means and said external passageway fluid inlet means and an outlet manifold coupled to, and in fluid communication with, said internal passageway gas outlet means and said external passageway fluid outlet means; and

whereby said internal passageway [or said external passageways] is[/are] adapted to receive or contain a gas, said external passageways are adapted to receive

or contain a fluid for effecting heat exchange with [a fluid] the gas in [the other of] said internal passageway [or said external passageways].

5. (Once Amended) A heat exchange assembly as claimed in claim 2 [3], said assembly constituting a panel sealed at the sides thereof by said spacing ribs and open at the ends thereof to provide access to said conduits which extend from one end of the panel to the other end thereof.

9. (Once Amended) A heat exchange assembly as claimed in claim 2 [3], and including:[-]

pressure relief means for relieving the pressure in said fluid passageway generated by heating fluid therein.

12. (Once Amended) A roofing panel incorporating a heat exchange assembly, said roofing panel including:[-]

an internal fluid passageway formed between a pair of spaced substantially parallel internal sheets for the passage therethrough of a fluid;

respective external passageways formed between each said internal sheet and a respective external sheet spaced from and substantially parallel to a respective internal sheet, [and]

spacing ribs between said sheets and forming with said sheets a plurality of fluid conduits within said internal fluid passageway and a plurality of external conduits within said external passageways;

said pair of internal sheets at the ends of said internal passageway extending beyond said external sheets at the ends of said external passageways thereby facilitating fusion welding to said internal sheets at the ends of said internal passageway, said panel being sealed at the sides thereof by said spacing ribs and being open at the ends thereof to provide access to said conduits which extend from one end of the panel to the other end thereof, and said internal passageway or said external passageways being adapted to receive or contain a gas for effecting heat exchange with a fluid in the other of said internal passageway or said external passageways; and

at least one manifold having a fluid communication means for the inflow or outflow of a fluid to or from said fluid conduits, and a gas communication means for the inflow or outflow of a gas to or from the external conduits.

14. (Once Amended) A [manifold] roofing panel as claimed in claim 12 wherein said manifold includes: [13, and including:-]

a receiving means for receiving the internal sheets and the external sheets whereby said fluid communication means and said gas communication means are sealingly connected to the fluid passageway and the external passageways respectively.

15. (Once Amended) A [manifold] roofing panel as claimed in claim 12 [13], wherein said manifold is an extrusion and said fluid communication means and said gas communication means are channels in said extrusion.

16. (Once Amended) A heat exchange panel including:-

an internal fluid passageway formed between a pair of spaced substantially parallel internal sheets for the passage therethrough of a fluid;

respective external passageways formed between each said internal sheet and a respective external sheet spaced from and substantially parallel to a respective internal sheet;

spacing ribs between said sheets and forming with said sheets a plurality of fluid conduits within said fluid passageway and a plurality of external conduits within said external passageways, and

manifold means including fluid communication means for the inflow or outflow of fluid to or from the fluid conduits, and gas communication means for the inflow or outflow of gas to or from the external conduits;

wherein said panel is sealed at the sides thereof by said spacing ribs and is open at the ends thereof to provide access to said conduits which extend from one end of the panel to the other end thereof, and said pair of internal sheets at the ends of said internal passageway extend beyond said external sheets at the ends of said external passageways thereby facilitating fusion welding to said internal sheets at the ends of said internal passageway.

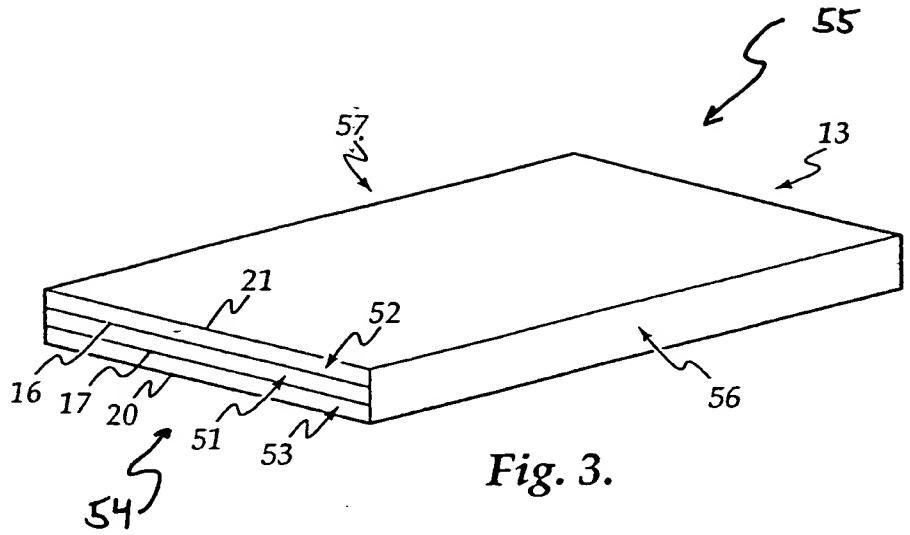

Fig. 3.

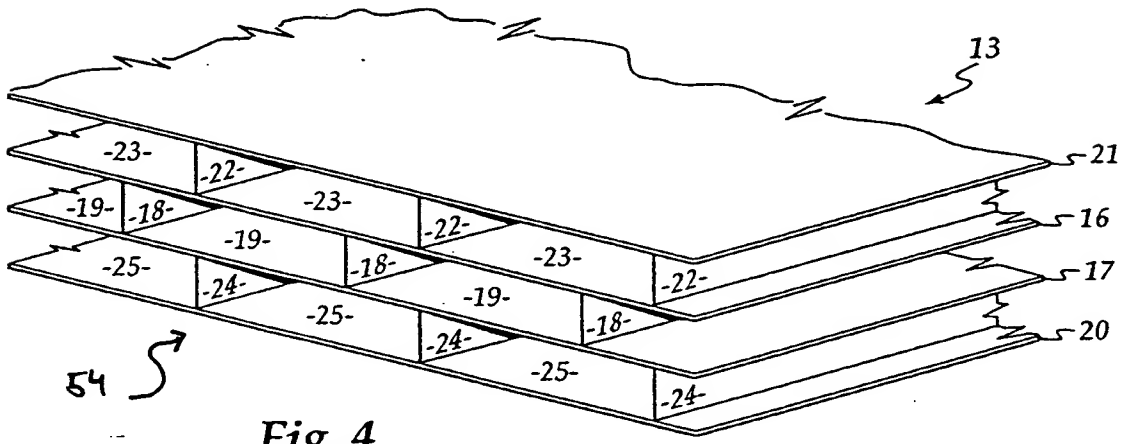

Fig. 4.

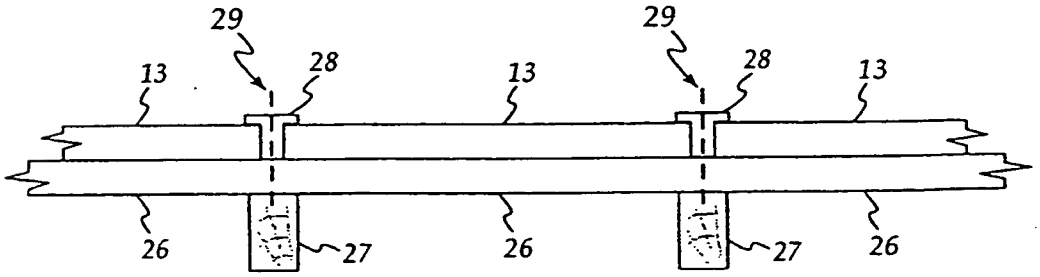

Fig. 5.

John K. Ford
Primary Examiner

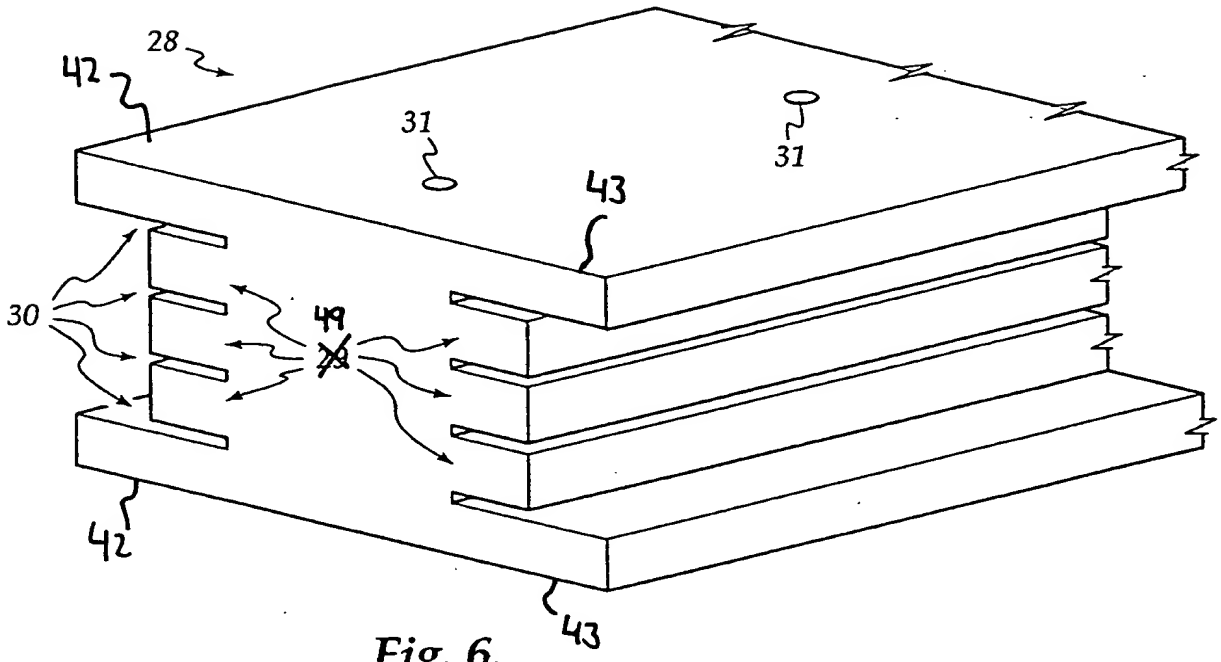

Fig. 6.

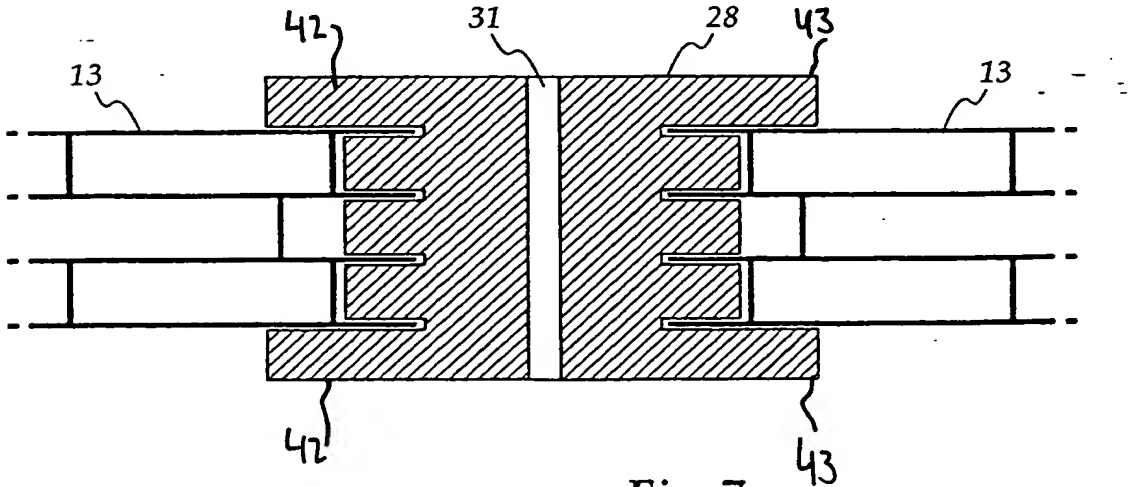

Fig. 7.

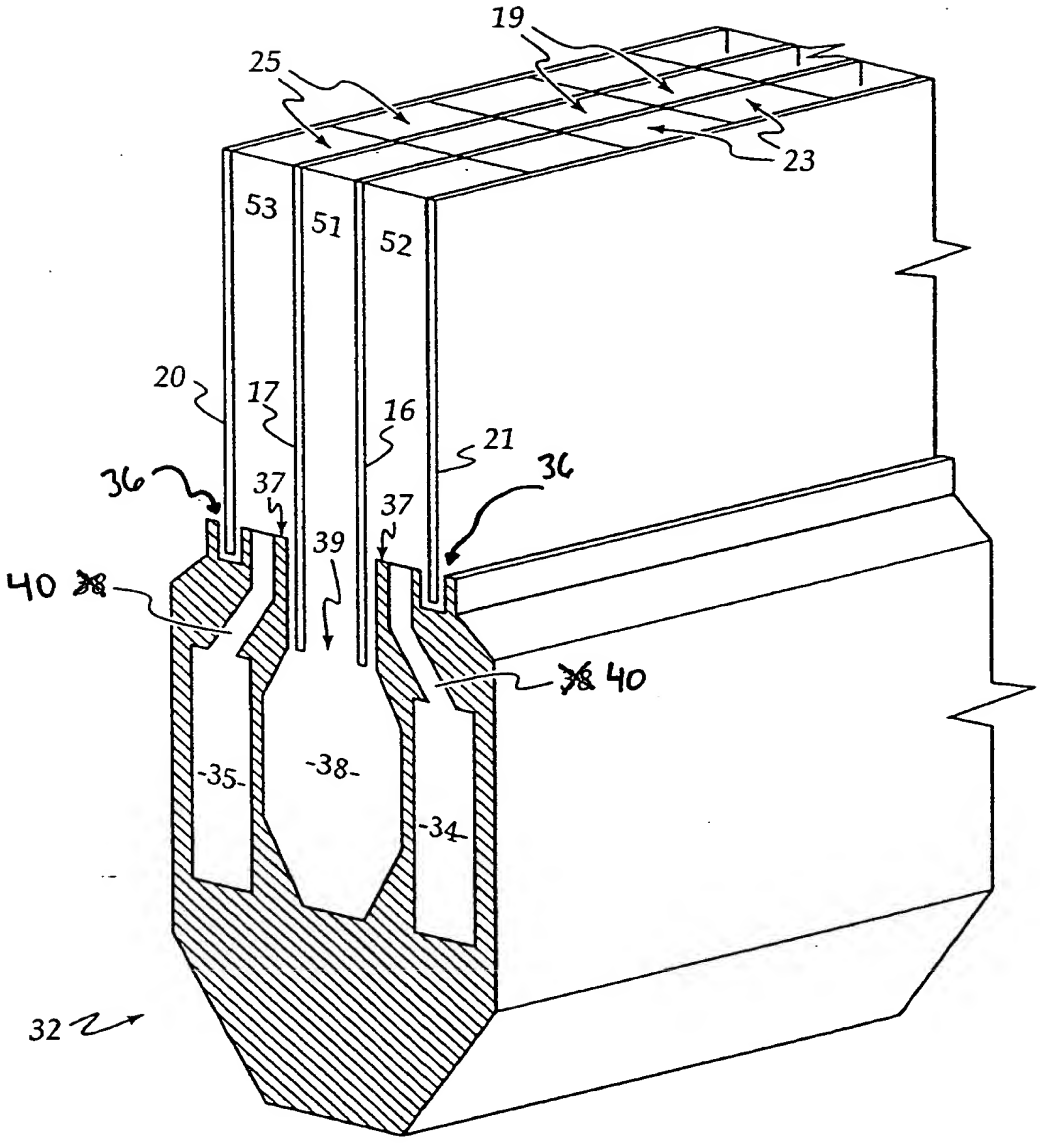

Fig. 8.